

Claims

1. A process for increasing the rate of biocatalysis reactions, which comprises applying a direct current electric field to a reaction mixture, wherein the reaction mixture and the electrodes used to apply said electric field are separated such that the reaction mixture does not come into contact with said electrodes.

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2. A process according to claim 1, wherein said electric field is applied for a sufficient time to stimulate the biocatalysis reaction in the reaction mixture.

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3. A process according to claim 1 or 2, wherein said reaction mixture and said electrodes are separated by a separation membrane.

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4. A process according to claim 3, wherein said separation membrane is any of an ion exchange membrane or a microporous membrane.

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5. A process according to claim 4, wherein said separation membrane is a bipolar ion exchange membrane.

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6. A process according to any of claims 1 to 4, wherein said electrodes form part of an electrochemical reactor.

7. A process according to claim 6, wherein said electrochemical reactor forms part of an electrodialysis stack, wherein charged organic products in the biocatalysis reaction medium can be

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removed by electrodialysis.

8. A process according to any of claims 1 to 7,
wherein said reaction medium is contained between a
5 bipolar membrane on the cathode-facing side and an
anion selective membrane on the anode-facing side of
said reaction medium.

9. A process according to any of claims 1 to 8,
10 wherein the reaction medium comprises a cationic
buffer system, with the organic product forming the
anionic component.

10. A process according to claim 9, wherein the DC
15 current applied is adjusted to control the pH of the
reaction mixture.

11. A process according to claim 10, wherein the
adjustment to the DC current is automatically
20 controlled under the control of a computer program.

12. A process according to any of claims 7 to 11,
wherein the biocatalysis and electrodialysis stages
are operated in separate, but linked, reactors, where
25 the biocatalysis reaction medium containing active
biomass can be recirculated continuously to the
electrodialysis reactor.

13. A process according to any preceding claim,
30 wherein the biocatalysis reaction comprises any of a
single enzyme biotransformation reaction, a
fermentation process or a reaction catalysed by an
isolated enzyme system.

35 14. A process according to any preceding claim,

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wherein the reaction mixture comprises any of growing or resting microbial cultures.

15. A process according to claim 14, wherein said
5 microbial mixtures comprise immobilised cultures of yeast, bacteria or fungi.

16. A process according to claim 15 wherein said
10 cultures are immobilised on the surface or in the pores of beads.